PATENT APPLICATION

RESPONSE UNDER 37 CFR §1.116
EXPEDITED PROCEDURE
TECHNOLOGY CENTER ART UNIT 1792

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Mark Henry SHIPTON et al. Group Art Unit: 1792

Application No.: 10/689,100 Examiner: M. MILLER

Filed: October 21, 2003 Docket No.: 117396

For: METHOD OF FORMING A DIFFUSION BARRIER ON A TITANIUM ALLOY SUBSTRATE

REQUEST FOR RECONSIDERATION AFTER FINAL REJECTION

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In reply to the July 6, 2009 Office Action, reconsideration of the rejection is respectfully requested in light of the following remarks.

Claims 1-12 and 23 are pending in this application.

Applicants appreciate the courtesies shown to Applicants' representative by Examiner Miller and Examiner Meeks in the August 27, 2009 personal interview. Applicants' separate record of the substance of the interview is incorporated into the following remarks.

The Office Action rejects claims 1-9, 11, 12 and 23 under 35 U.S.C. §103(a) as being unpatentable over Klotz (U.S. Patent No. 3,395,027) in view of Bomberger (U.S. Patent No. 3,434,813), citing Nguyen-Dinh (U.S. Patent No. 5,908,516) and Jackson (U.S. Patent Application Publication No. 2003/0082053) as evidence. The Office Action rejects claim 10

under 35 U.S.C. §103(a) as being unpatentable over Klotz and Bomberger in view of Mosser (U.S. Patent No. 5,803,990), Troczynski (U.S. Patent Application Publication No. 2002/0107133) and Wydra (U.S. Patent No. 3,857,717). These rejections are respectfully traversed.

As discussed during the August 27 interview, it would not have been obvious to combine the coating method of Klotz with Bomberger because those of ordinary skill in the art would not have believed a coating method for magnesium, as disclosed in Klotz, would be applicable on titanium. Specifically, magnesium and titanium have substantially different chemical properties, and corrode in different manners and environments. Furthermore, as will be shown below, it is known in the art that different coating techniques must be used for preventing corrosion in magnesium and titanium. As such, those of ordinary skill in the art would not have believed it would be obvious to try the coating methods of Klotz with the titanium disclosed in Bomberger.

Independent claim 1 recites a method for forming a diffusion barrier on a titanium alloy to prevent corrosion. As discussed during the personal interview, Klotz discloses a method for coating magnesium, or other metals that corrode by water, salt spray or the like, against corrosion. The Office Action asserts that Klotz discloses each step of the method of claim 1. Bomberger discloses that it is possible to coat titanium to prevent corrosion. The Office Action asserts that it would be obvious to use the method of Klotz on titanium, as suggested by Bomberger.

However, as previously argued in past replies, this assertion lacks merit for because (1) titanium does not corrode in saltwater, salt spray or the like at standard temperatures and (2) it is known in the art that protective coatings to prevent corrosion must be tailored based on the type of metal, and in particular tailored based on whether the non-ferrous metal to be coated is an active (magnesium) or a noble (titanium) metal.

First, the Office Action asserts that it would be obvious to apply the methods of Klotz to titanium because titanium corrodes in the presence of seawater. However, titanium does not corrode in the presence of saltwater at room temperature, as magnesium does. See CRC Handbook of Chemistry and Physics, page 4-31 (copy attached) stating "[Titanium] has excellent resistance to sea water and is used for propeller shafts, rigging, and other parts of ships exposed to salt water. Titanium only corrodes in sea water at elevated temperatures of 400 C or higher. As such, those of ordinary skill in the art would not have associated titanium as one of the metals that deteriorates in the presence of saltwater mentioned in Klotz.

Second, those of ordinary skill in the art would not believe a method for coating magnesium (or the like) would work on titanium, because titanium is typically coated at temperatures that magnesium (and other metals envisioned by Klotz) cannot withstand. Klotz discloses a method to coat metals that react to seawater. It cites magnesium as its primary example. However, other metals that might also qualify would be aluminum and zinc. See Mark's Standard Handbook for Mechanical Engineers, 10th Edition ("Mark's"), Fig. 6.5.4 (submitted with March 12, 2009 Response) showing magnesium, zinc and aluminum as highly reactive metals.

Trocyynski discloses that there are difficulties in coating some metallic substrates when the metals cannot withstand the heat of the coating process. Trocyynski specifically notes that "the high temperature requirement for heat treatment is unacceptable for most metallic substrates due to melting (e.g. Al, Mg, Pb, Zn and others)." See Trocyynski, paragraph [0041]. Trocyynski further states that for aluminum and magnesium alloys the maximum curing temperature must be below 600 C. See Trocyynski, paragraph [0042]. Likewise, the method disclosed in Klotz discloses curing temperatures of 500-1000 F (~260-537 C). See Klotz, col. 3, lines 49-52.

But Bomberger discloses a method of coating titanium in which the titanium is cold coated with zinc and then heated to 1200 C. Likewise, WO 94/18359 (disclosed and mentioned in Applicants' specification) discloses a coating method for titanium that involves a step of heating the titanium with certain coating materials in a vacuum at 750 C. Applicants submit this as evidence that coating methods of Magnesium and titanium differ significantly. Thus, those of ordinary skill in the art would not have believed that methods for coating magnesium and the like (as disclosed in Klotz) have applicability to titanium and vice versa because the coating methods normally associated with titanium involve temperature ranges unusable for magnesium.

Third, titanium corrodes via a completely different chemical mechanism than magnesium. Magnesium is an active metal. See Mark's, page 6-100, and Fig. 6.5.4. As such, magnesium is subject to galvanic corrosion. By contrast, titanium is a noble metal. See Mark's, Fig. 6.5.4. Mark's notes that when forming a protective barrier to prevent corrosion, the barrier properties must be tailored based on whether the metal is noble. See Mark's 6-104. Specifically, 'noble (determined by galvanic series) coatings must be thicker and have a minimum number of pores." See Mark's 6-104. By contrast, "porosity of sacrificial coatings is not critical as long as cathodic protection of the base metal continues." See Mark's, 6-104. Thus, those of ordinary skill in the art know that coatings for metals must be uniquely tailored based on the chemical composition and corrosive properties of the metal to be coated.

The MPEP states that for a combination to be obvious to try, one of ordinary skill must have "a reasonable expectation of success." See MPEP §2143(E). Because those ordinary skill in the art know that titanium and magnesium have such different properties and require unique corrosive resistant coatings, they would not have believed there was such a reasonable expectation of success that a coating method for magnesium, or any other metal that similarly corrodes in seawater, would be operational when applied to titanium. Rather, those of ordinary

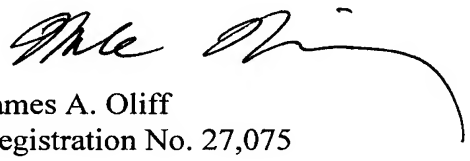
skill in the art would have believed substantial testing would have been required to adapt the methods of Klotz to titianium, and then tested to ensure success. As such, it would not have been obvious to combine the methods of Klotz to titanium as suggested by the Office Action.

Accordingly, for at least the above reasons, withdrawal of the rejection of claim 1, and claims 2-12 and 23 depending therefrom, is respectfully requested.

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of the claims are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



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Attachment:
Page 4-31 of CRC Handbook of Chemistry and Physics, 78th Edition.

Date: September 16, 2009

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